

Bird Population Changes in a Hamilton County, Ohio, Forest¹

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ABSTRACT. We monitored breeding bird populations in a woodland plot in Hamilton County, OH. By comparing historical data (1991-1998) with 2003 populations, we observed a decrease in the populations of more species than expected by chance. In contrast, few species showed a population increase. Overall, the total number of territorial males in 2003 was 12% below the average number from 1991 to 1998.

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INTRODUCTION

Since its discovery in the United States in 1999, West Nile Virus (WNV) has swept through the lower 48 states. The virus has been found in at least 120 bird species (Malakoff 2002). Causey and others (2003) reported that among songbirds wintering in Costa Rica there is a precipitous decline in their abundance compared to previous years. This report adds to the concern of a widespread decline in bird populations (Malakoff 2002).

The Breeding Bird Census (Terborgh 1989) coordinated by the Cornell University Laboratory of Ornithology, is a particularly useful tool for monitoring bird populations in stable environments, such as mature woods. In contrast, Breeding Bird Surveys monitor bird populations along a highway and Christmas Bird Counts monitor bird populations within a specified, 15-mile diameter circle. Both of these are subject to changing land use patterns and resulting habitat changes, confounding analysis. However, the Breeding Bird Census is limited in that the habitat studied is not used by all species, as indicated by the absence in our woodland plot of American Crow (*Corvus brachyrhynchos*), a species particularly susceptible to WNV (Bonter and Hochachka 2003).

From 1991 to 1998 we carried out a Breeding Bird Census in a forested plot near Cincinnati, OH. To monitor possible changes in bird populations, we performed a census in the same plot in 2003.

MATERIALS AND METHODS

The census was conducted in a mature deciduous forest (Saunders and others 1994) in Miami Whitewater Forest, a Hamilton County park in extreme southwestern Ohio. The longitude and latitude of the center of the plot are 84° 45.904' W, 39° 14.707' N. The forest canopy is dominated by Sugar Maple (*Acer saccharum*), White Ash (*Fraxinus alba*), and White Oak (*Quercus alba*), with Garlic Mustard (*Alliaria petiolata*) the dominant plant of the ground cover. The census plot comprises 16 ha within a larger mature forest. The census was performed according to guidelines (Hall 1946; Robbins 1970),

with 10 site visits in each census year, spanning the last week of May to the second week of July. Territorial males were counted based on maps of the accumulated observations.

RESULTS

The number of territorial males in 2003 was compared to the mean and standard deviation of territorial males for that species in the 1991 to 1998 censuses (Table 1). Species with a mean number ≤ 1 were excluded from the analysis. In 2003, 2 species (Red-eyed Vireo, Acadian Flycatcher) were at least 1 standard deviation above their previous mean. With a total of 21 species under consideration, one would expect 3 species to be 1 standard deviation above (and below) the mean. In contrast, 7 species (Scarlet Tanager, Rose-breasted Grosbeak, Tufted Titmouse, White-breasted Nuthatch, Downy Woodpecker, Northern Cardinal, Hooded Warbler) were at least 1 standard deviation below their historical mean. The number of declining species was higher than expected by chance ($P = 0.04$, exact binomial probability, $P = 0.05$ when we define decline as a 2003 level below the lower 17% prediction limit (that is, $t = 1$, $df = 7$)). Of these, the Hooded Warbler, absent as a breeding bird in 2003, was 2 standard deviations below its mean, and the Tufted Titmouse was 3 standard deviations below its mean. When the number of territorial males for all species were considered together, the total for 2003 (88 males) was below the lower limit of the 98% prediction interval (88.97) based on historical levels (mean 97, $sd = 2.62$, $n = 8$).

DISCUSSION

Our results indicate that in 2003 there was a statistically significant decline in the total number of territorial males and in the number of territorial males in more bird species than would be expected by chance. Our methods do not allow us to attribute particular causes to the declines in individual species; a variety of causes are presumed to be acting. Brood parasitism by Brown-headed Cowbirds, WNV infection, loss of wintering habitat of neotropical migrants, and habitat degradation and loss on breeding ranges are all factors acting on populations of North American birds (Terborgh 1989, Causey and others 2003).

The sharp decline in the number of Tufted Titmouse territories is consistent in both magnitude and timing

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TABLE 1

Territorial males found on censuses during 1991-98 and 2003.

Species	Territories 1991-98 mean	Territories 1991-98 std. dev.	Territories 2003
Wood Thrush (<i>Hylocichla mustelina</i>)	15.9	4.0	14.0
Red-eyed Vireo (<i>Vireo olivaceus</i>)	8.9	1.3	11.5
Acadian Flycatcher (<i>Empidonax virescens</i>)	6.3	1.9	9.5
Tufted Titmouse (<i>Baeolophus bicolor</i>)	5.6	0.7	3.5
Northern Cardinal (<i>Cardinalis cardinalis</i>)	5.6	1.7	3.5
Scarlet Tanager (<i>Piranga olivacea</i>)	5.4	1.0	4.0
Eastern Wood Peewee (<i>Contopus virens</i>)	5.0	0.8	5.5
White-breasted Nuthatch (<i>Sitta carolinensis</i>)	4.5	0.9	3.5
Red-bellied Woodpecker (<i>Melanerpes carolinus</i>)	4.3	1.4	4.5
Brown-headed Cowbird (<i>Molothrus ater</i>)	4.1	0.6	4.0
Downy Woodpecker (<i>Picoides pubescens</i>)	3.4	0.9	2.0
Carolina Chickadee (<i>Poecile carolinensis</i>)	3.4	1.2	2.5
Hooded Warbler (<i>Wilsonia citrina</i>)	3.3	1.2	0.0
Blue Jay (<i>Cyanocitta cristata</i>)	3.1	0.9	3.0
Rose-breasted Grosbeak (<i>Pheucticus ludovicianus</i>)	2.4	1.1	0.5
Hairy Woodpecker (<i>Picoides villosus</i>)	2.3	0.9	2.0
American Robin (<i>Turdus migratorius</i>)	2.3	1.3	1.5
Northern Flicker (<i>Colaptes auratus</i>)	1.8	1.3	1.0
Carolina Wren (<i>Thryothorus ludovicianus</i>)	1.6	0.9	1.0
Kentucky Warbler (<i>Oporornis formosus</i>)	1.6	0.5	1.5
Yellow-throated Vireo (<i>Vireo flavifrons</i>)	1.1	1.0	1.0

with WNV being a cause, as has been proposed for Parid populations elsewhere (Bonter and Hochachka 2003). On the other hand, the dramatic change seen in the Hooded Warbler cannot be attributed entirely to WNV as the number of Hooded Warbler males had declined in 1998 prior to the discovery of WNV in North America. Banding records at a nearby Miami Whitewater Forest site also indicate a decline in Hooded Warblers prior to the arrival of WNV (Lester Peyton, personal communication). One possibility is that the Hooded Warbler loss is due to accumulated understory damage from the large White-tailed Deer (*Odocoileus virginianus*) population.

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